DOCUMENT RESUME

ED 338 481 SE 052 132

AUTHOR Marganoff, Bruce, Comp.
TITLE A Resource Guide to Elementary Science Programs. National, State and Community-Based Programs.
INSTITUTION New Jersey State Dept. of Education, Trenton. Div. of General Academic Education.
PUB DATE 91
NOTE 46p.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Astronomy; Biology; Computer Uses in Education; Conservation (Environment); Ecology; Elementary Education; *Environmental Education; Inservice Teacher Education; Marine Biology; *Mathematics Education; Physical Sciences; Plants (Botany); *Program Descriptions; Resource Materials; Science Curriculum; *Science Education; Teaching Methods; Zoos
IDENTIFIERS *National Diffusion Network Programs; *New Jersey

ABSTRACT

This document, which reviews national, state, and local science activities and programs, provides educators with concrete examples of varied science programs that are a valuable resource for teaching science skills and proficiencies. This resource guide is intended to help educators supplement, amend, and revise their elementary science programs based on successful practices already in place in other districts. The first section, "National Diffusion Network--Programs That Work," contains listings of programs that have undergone extensive testing and were approved only if there was evidence that the programs met the stated objectives. In addition, the program directors had to provide evidence that the program would also meet the needs of other groups similar to the one tested. All of the programs listed from the National Diffusion Network are presented with a common format that includes program name, audience (grade level), description, requirements, costs, services, and contact. The following programs are listed: (1) "Conservation for Children;" (2) "PROJECT ECOLogy"; (3) "Informal Science Study" (ISS); (4) "Marine Science Project"; (5) "Starwalk"; (6) "Project Zoo"; (7) "Curriculum Modification through Environmental Studies"; and (8) "Project Kare." The second and third sections list 26 science and 12 science and mathematics programs and practices originating outside of New Jersey. Each listing contains the grade level, description, and contact. The fourth section contains listings of 11 programs offered by community groups and associations in New Jersey. Each listing includes the organization name, project, target population, contact person, and program description. (KR)

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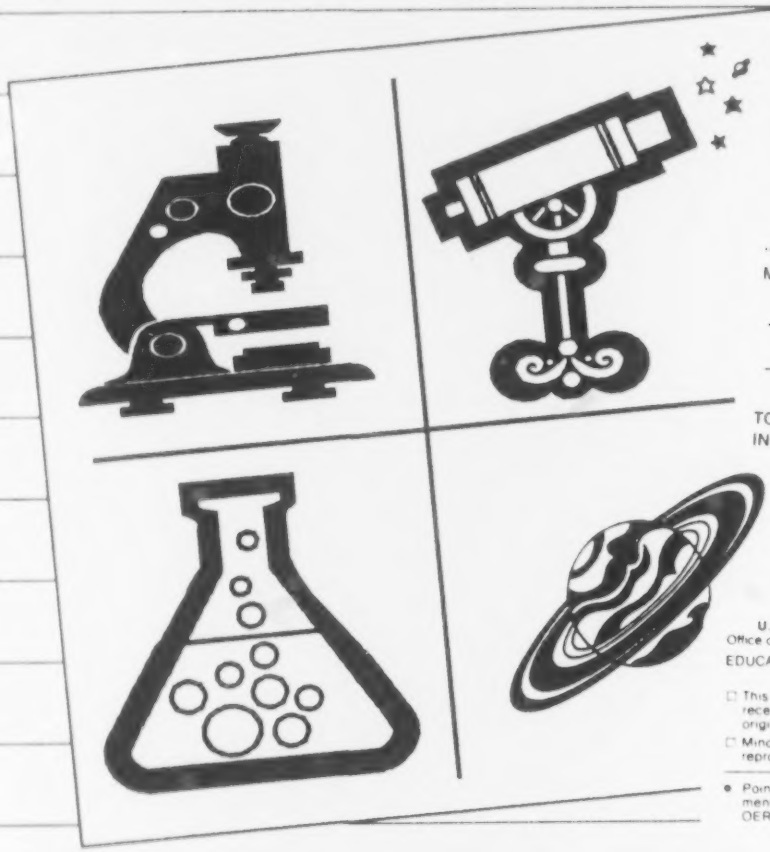
A Resource Guide to Elementary Science Programs



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National, State, and Community - Based Programs

New Jersey State Department of Education, Division of General Academic Education

SE 052 132

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A RESOURCE GUIDE TO ELEMENTARY SCIENCE PROGRAMS

National, State, and Community-Based Programs

JOHN ELLIS
COMMISSIONER OF EDUCATION

JACQUELINE L. CUSACK
ACTING ASSISTANT COMMISSIONER
DIVISION OF GENERAL ACADEMIC EDUCATION

COMPILED BY:

BRUCE MARGANOFF
DIVISION OF GENERAL ACADEMIC EDUCATION

NEW JERSEY STATE DEPARTMENT OF EDUCATION
225 WEST STATE STREET
CN 500
TRENTON, NEW JERSEY 08625

WINTER, 1991

PTM 1006.00

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FOREWORD

The New Jersey Initiative to Improve Elementary Science, designed to help local school districts improve their elementary science programs, calls for the development of a series of products to meet identified needs in elementary science instruction and curriculum.

Three products relating to the initiative have already been disseminated to New Jersey educators. These products are as follows:

- Elementary Science Curriculum Guide, which outlines the broad spectrum of high-level proficiencies that are benchmarks for developing and maintaining excellence in science programs for the students of New Jersey;

- The Elementary Science Safety Manual, which is designed to assist school districts and elementary school teachers by alerting them to the potential dangers of certain simple classroom activities and to specific precautions that will ensure safe instruction and experimentation in the classroom; and

- Computer and Video Instructional Materials - Resource Guide: Elementary Science, which presents a listing of instructional software and video materials that coordinate with and support the skills and proficiencies contained in the Elementary Science Curriculum Guide.

This document, A Resource Guide to Elementary Science Programs, which reviews national, state, and local science activities and programs, provides educators with concrete examples of varied science programs that are a valuable resource for teaching science skills and proficiencies.

I invite you to use this publication in concert with the other products of the Elementary Science Initiative. The information should be helpful to you in your efforts to develop and improve elementary science programs in your district.

John Ellis
Commissioner

ACKNOWLEDGMENTS

A Resource Guide to Elementary Science Programs was developed with the help of a number of professional educators in the fields of elementary science. At the national level, such organizations as the National Science Teachers' Association, National Science Foundation, National Dissemination Network, and Cosmos provided reviews of many fine programs. At the state level, many educators submitted suggestions and information about specific programs, activities, and organizations that focus on elementary science. Although these sources are too numerous to mention individually, this document could not have been assembled without their efforts. Additionally, a note of thanks must go to those in the field who served as reviewers and editors of the content of the document. These individuals possess a broad range of knowledge and experience in the area of science, and their contributions of time and effort are greatly appreciated.

TABLE OF CONTENTS

PAGE

Introduction..... 1

Program Types

NATIONAL PROGRAMS..... 3

- National Diffusion Network - Programs That Work..... 4
- Science Programs and Practices Originating Outside of New Jersey..... 13

NEW JERSEY PROGRAMS..... 33

- Programs offered by New Jersey Community Groups and Associations..... 34

INTRODUCTION

Educators maintain that a quality science program is an absolute essential if a youngster is to be knowledgeable about and participate wisely in our rapidly changing technological society and that science instruction in the early grades should be a priority concern.[1] Yet in spite of its importance, the study of science has not been emphasized in many school systems.[2] If knowledge of science is deemed important, however, we must address the indifference with which the subject has often been treated.[3]

In response to this problem, the State Board of Education adopted The New Jersey Initiative to Improve Elementary Science in the fall of 1985 to spark interest in science education and to help teachers identify the content and skills that are an appropriate foundation for further science study.[4] As part of the initiative, the New Jersey State Department of Education developed the Elementary Science Curriculum Guide. This resource for teachers, administrators, and other educators who are interested in improving their science programs contains proficiencies and skills that are necessary to a quality elementary science program and provides the framework for the other documents in the series.

A Resource Guide to Elementary Science Programs has been developed to provide educators with information on varied activities and programs that support the specific proficiencies and skills outlined in the Elementary Science Curriculum Guide. The resource guide is intended to help educators supplement, amend, and revise their elementary science programs based on successful practices already in place in other districts. There is no need to "reinvent the wheel" to improve science instruction or to develop a truly good science program.

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1 New Jersey State Department of Education. (1985). The New Jersey Initiative to Improve Elementary Science, p. 87.

2 Report of the Advisory Council on Math/Science Teacher Supply and Demand. (1983, November). N.J. p. 26.

3 Commission on Precollege Education, Science and Technology. (1983). Educating Americans for the 21st century. Washington DC: The National Science Board, p. 45.

4 National Assessment of Education. (1979). Attitudes Toward Science (Report #08-S-02). Educational Commission of the States, p. 15.

NATIONAL PROGRAMS

NATIONAL DIFFUSION NETWORK

The National Diffusion Network is dedicated to helping local school districts in their efforts to improve educational opportunities for their students. The organization has found that there are few problems encountered by schools that have not been solved successfully in some other location. By offering a wide variety of programs, the Network provides many options through which the local educational agencies may solve their own unique problems without "reinventing the wheel."*

This section contains listings of programs reviewed by the National Diffusion Network. These programs have all undergone extensive testing and were approved only if there was evidence that the programs met the stated objectives. In addition, the program directors had to provide evidence that the program would also meet the needs of other groups similar to the one tested.

All of the programs listed from the National Diffusion Network are done with a common format. The format is as follows:

Program Name
Audience (Grade Level)
Description
Requirements
Costs
Services
Contact

NOTE: Each of the programs listed by the Network has passed a panel review. The Joint Dissemination Review Panel (JDRP) or the Program Effectiveness Panel (PEP) certifies the quality of the program.

Source: Excerpted from the National Diffusion Network Manual (Ed. 12). 1984, Revised 1986.

NATIONAL DIFFUSION NETWORK - PROGRAMS THAT WORK*

		PAGE
1.	Conservation For Children	6
2.	PROJECT ECOLogy	7
3.	Informal Science Study	8
4.	Marine Science Project	8
5.	Starwalk	9
6.	Project Zoo	10
7.	Curriculum Modification through Environmental Studies	11
8.	Project Kare	12

1. **CONSERVATION FOR CHILDREN**: A practical, economical program to increase conservation awareness, understanding, and efforts of elementary school children through a variety of basic skills activities designed for use in the classrooms.

AUDIENCE: Approved by JDRP for children in grades 1-6.

DESCRIPTION: Through a variety of basic skills activities intended for use in the classroom, **Conservation for Children** teaches about the interdependence of plants and animals, the requirements of life, energy sources and use, pollution problems, recycling, and other conservation concepts. The grade-level conservation guides include instructional materials that provide basic skills practice in language arts, math, social studies, and science as they develop conservation concepts. Teachers can use the materials as a primary resource for teaching basic skills, as supplementary materials to a core program, as enrichment activities, as skill review, or as independent units of study. Criterion-referenced tests allow teachers to determine whether the materials are appropriate for use with individual students or groups. Special education teachers have found the materials valuable for use with their students due to the high interest level of the worksheets and the range of ability levels and basic skills concepts addressed.

Evaluation data confirm that students using the materials for a minimum of 3 minutes per week master 80 percent of the learning objectives. In addition, 75 percent of the parents of 2,000 students in the evaluation study responded in writing that students had no prior knowledge of the program materials.

REQUIREMENT: The program, which may be used in any type of facility or setting, does not rely on any particular methodology or teaching style, nor does it require any materials or equipment that are not normally found in any school. The curriculum guides may be reproduced in whole or in part with the permission of the authors. Inservice as to implementation and use of the material is minimal, usually two hours.

COSTS: **Conservation for Children** materials include six grade-level curriculum guides (1-6) and one all-levels guide (activities resources). With the exception of the initial purchase of the guides ($15 per grade level, $105 for the complete program), there are no additional costs for personnel, materials, or in-service training. The per-pupil cost is $50.

SERVICES: Program brochures are available at no cost. Visitors are welcome at the project site by appointment. Project staff are available to attend out-of-state awareness meetings (with costs for travel expenses to be negotiated).

CONTACT: Marilyn Bodourian, Project Director; Conservation for Children; John Muir Elementary School; 6560 Hanover Drive; San Jose, California 95129. (408) 725-8376.

2. **PROJECT ECOLogy** (Environmental Career-Oriented Learning): A project integrating ecological concepts, career information, and future understanding into basic skills subject matter.

AUDIENCE: Approved by JDRP for grade 2 students of all abilities.

DESCRIPTION: The project's goal is to infuse ecology/science concepts, career information, and an awareness of and sensitivity to the future into basic skills subject matter using an easily implemented format. Cycles, recycling, food, nutrition, pollution, and careers are all topics of the ECOLogy program. The project uses a motivating series of lessons, units, strategies, and activities which have been designed by teachers. Each unit is packaged to be used in a classroom over a four-week period, ordinarily for one hour per day. The units are called "Environmental Learning Experiences" (ELEs), and many of them have supporting Project Activity Kits (PAKs). Additionally, among the 28 units available, there are six primary, 14 intermediate, and 8 secondary units.

Half of the **PROJECT ECOLogy** units have activities that relate specifically to the development of skills in higher-level thinking; analyzing data; identifying trends, patterns, and sequences; predicting outcomes; testing outcomes; and exploring open-ended questions. Fourteen of the units have information and activities that relate specifically to career information that includes: career options, occupational basic skills, job availability, aptitude, education and training opportunities, and job-securing skills. Each Environmental Learning Experience is attractively packaged with a picture of the Project Activity Kit, background information, conceptual overview, master material list, pre-unit activities, and guided lessons. The contents of the unit focus on energy, water, air, solid waste, and noise. The materials are easily adopted by individual classroom teachers.

REQUIREMENTS: The **PROJECT ECOLogy** materials are available to school districts on a limited basis. Full implementation of the program requires training, inventory, and support services. The Highline District recommends a training workshop, but this is not essential for full implementation of the program.

COSTS: The Environmental Learning Packets are available through the Highline District for $3.50 each. The Project Activity Kits are usually assembled by the adopting district for an average cost of $130.

SERVICES: Program brochures for **PROJECT ECOLogy** are available on a limited basis. Visitors are welcome at the project site by appointment. Project staff are available too on a cost-reimbursement basis.

CONTACT: Bill Guise; Highline School District; 15675 Ambaum Boulevard, SW; Seattle, Washington 98166. (206) 433-2453.

3. **INFORMAL SCIENCE STUDY (ISS)**

AUDIENCE: Approved by JDRP for all students in grades 5-12.

DESCRIPTION: ISS supplementary is a program of physical science mini-units that draw on student experiences with amusement park rides, sports, and playground and student dialogue to promote concept acquisition. The experiences, which are selected for their student appeal, provide concrete examples of otherwise abstract concepts of motion, acceleration, relativity, forces, gravity, time, graphing, conservation of energy, and frames of reference.

Each of the mini-units contains an introduction and a review and application of physical science and mathematics in low-key, predominantly non-technical language. Physical science terms are introduced only after instruction as needed. In addition, several of the units provide laboratory experiences using toys (race cars, model rockets, etc.) and playground equipment.

With instructional periods of 1-3 weeks, students demonstrate analytic recall of science experiences, increased knowledge and comprehension of science concepts, and facility in applying science concepts in unique situations. Instruments by which students were measured were constructed and validated as part of the curriculum design and evaluation procedures.

REQUIREMENTS: The mini-units may be adopted individually or as a package. Teacher training requires four hours.

COSTS: Costs, including training, materials, and equipment, are approximately $1.21 per student (n=500), with a recurring cost of $.60 per student per year.

SERVICES: Program brochures are available at no cost. Visitors are welcome at the project site by appointment. Project staff are available for orientation meetings (cost to be negotiated).

CONTACT: Dr. Howard Jones; University of Houston; Room 348 Farish Hall; Houston, Texas 77004. (713) 749-1624 and 749-3584.

4. **MARINE SCIENCE PROJECT: FOR SEA**: A comprehensive activity-oriented marine science curriculum for teaching basic marine science skills and knowledge.

AUDIENCE: Approved by JDRP for all students, grades 2, 4, 6, 7, 8, and 9-12.

DESCRIPTION: Over 70 percent of planet Earth is covered by water. By the year 2000, three out of four Americans will live within an hour's drive of the sea or Great Lakes coasts. The impact of this dense population on these coastal waters will be severe. The

curriculum materials of FOR SEA are designed to equip students with information necessary to protect and maintain the world of water.

The program provides activity-oriented, multidisciplinary marine education materials for use as a self-contained unit or a supplemental program. Curriculum guides for each of the grade levels contain a conceptual framework; a guide to marine aquaria in the classroom; a selected bibliography of children's literature of the sea; a bibliography of juvenile information books of the sea; background information for each activity; answer keys and a listing of vocabulary words for each unit; and masters for all students' activity and text pages.

The **Marine Science Project: FOR SEA** is effective in teaching basic science skills and knowledge as measured by the CTB McGraw-Hill CTBS Science tests. The magic draw of water provides incentive to teach and learn science. Proximity to sea water is not necessary to implement this curriculum in the classroom.

REQUIREMENTS: The program requires eight hours of in-service training that provide an overview of the project, text implementation procedures, and activities designed to familiarize teachers with the materials. Project staff provide support during the entire adoption process.

COSTS: A copy of the appropriate grade-level curriculum guide must be purchased for each implementing classroom teacher at $25 per guide. Student text and activity pages may be purchased from the project or reproduced by the adopting district. Hands-on materials are generally found in the school setting or are readily available through the project, tailored to local needs.

SERVICES: Program brochures and samples of the curriculum are available. Project staff will provide orientation sessions and in-service training on a cost-sharing basis. Follow-up services are provided by staff through telephone, mail, cassette tape, and visits.

CONTACT: Margaret Philbrick, Developer/Demonstrator; Marine Science Center; 17771 Ford Drive N.E.; Paulsboro, Washington 98370. (206) 779-5549.

5. **PROJECT STARWALK**: A comprehensive earth/space science program for elementary students.

AUDIENCE: Approved by JDRP for grades 3 and 5. The program has also been used in other grades.

DESCRIPTION: **Project STARWALK**, a cooperative science program offered by elementary schools and a planetarium, provides differentiated instruction in earth/space concepts for students with various developmental levels. Through a series of lessons, students

prepare for three visits to the planetarium which serves as the lab facility for the program. Planetarium handbooks and teaching packets containing the instructional materials and follow-up activities support a process approach to observing, graphing, and predicting basic earth science concepts. Classroom teachers participate in the activities along with their students. Students in grade 3 are introduced to the stars and constellations of our galaxy and to the concepts of rotation, revolution, and time. Students in grade 5 study the planets and the earth's rotation, revolution, and axial tilt as factors affecting seasons around the world.

REQUIREMENTS: In-service orientation and technical assistance are available, as well as a management system for scheduling of students, equipment or service purchase, and dissemination and evaluation. Although a minimal amount of instructional materials is needed, a planetarium model is a necessary component of **Project STARWALK.** The program is designed to be used sequentially with third- and fifth-grade students.

COSTS: The instructional, management, and training materials packet costs $20 per package. Two evaluation kits, at $25 per kit, are necessary. Instructional materials may be duplicated for participating teachers and students at the adoption site. Per-pupil cost per year is dependent upon costs for student transportation to the planetarium, planetarium fees, and supplies.

SERVICES: Program brochures are available at no cost. Program staff will provide orientation sessions and training (with cost to be negotiated). Visitors are welcome at the project site, by appointment, during the school year.

Implementation and follow-up services are also available. Evaluation kits include 100 student scan sheets, student response summaries for pre- and posttests, classroom means for pre- and posttests, and statistical information.

CONTACT: Mr. Bob Riddle, Director; Project STARWALK; Lakeview Museum Planetarium; 1125 West Lake Avenue; Peoria, Illinois 61614. (309) 686-NOVA.

6. **PROJECT ZOO: ZOO OPPORTUNITIES OUTREACH**: A series of curriculum materials related to the study of animals to supplement and enrich existing classroom programs through experimental learning.

AUDIENCE: Approved by JDRP for K-6 students of all abilities.

DESCRIPTION: **Project ZOO** is an studies program that offers varied multisensory and multimedia learning experiences to augment zoo field trips. While children explore the world of animals and learn about conservation and ecology, they engage in activities that involve not only science, but language, mathematics, social studies, music, and

art. The six units of study contain nearly 300 project-developed materials pertaining to Animal Characteristics, Animal Behavior, and Animal Homes and Habitats for the primary grades and Classification, Adaptation, and Interdependence of Animals for the intermediate grades. Study prints, flash cards, student booklets, worksheets, and games make the program an interesting and successful experience, stimulating more self-direction and causing more positive personal interaction. The materials are appropriate for any learning style and have proved effective even when a trip to the zoo is not possible. The teacher's manual contains background and introductory information, activity suggestions, and a bibliography of resources. This manual, along with all necessary materials, comprises a teaching kit. The materials, which include such worksheet activities as crossword puzzles, word search games, and matching items that can be enlarged for posters or games, were teacher-created. A sample kit of materials is available for review.

A comparison of students in **Project ZOO** classrooms with students in control classrooms showed that the project students gained significantly more in their knowledge and understanding of the concepts and processes of each of the six units.

REQUIREMENTS: **Project ZOO** highly recommends a one-day workshop session although teachers can teach the units without training.

COSTS: The kits, which are individually priced, are complete except for a few available materials, such as yarn, paper, and plastic bags. The cost of individual kits are: Animal Characteristics, $110.00; Animal Behavior, $80.00; Animal Homes and Habitats, $85.00; Classification, $244.50; Adaptation, $203.50; Interdependence of Animals, $195.50. Complete set, $859.75.

SERVICES: A sample kit is available for a 15-day free examination. In-service training is available.

CONTACT: Steve Binkley; Carolina Biological Supply Company; 2700 York Road; Burlington, North Carolina 27215. (919) 584-0381.

7. **CURRICULUM MODIFICATION THROUGH ENVIRONMENTAL STUDIES**: A sequential, hands-on, field-oriented study of estuarine ecosystems, highlighting the natural system and the effects of human interaction.

AUDIENCE: Approved by JDRP for students of all abilities, grades K-8.

DESCRIPTION: This comprehensive, teacher-written program for grades K-8 is a multidisciplinary approach with 37 learner-based objectives. Each objective is addressed by one or more instructional units and reinforced by a specific field activity. Curriculum materials that include learning activity packages, activities booklets, puzzles, games, and slide-tape programs are used to introduce an annual field trip. The class and teacher then visit an Environmental Studies Center

for a period of time that varies with grade level (ranging from two hours for kindergarten to two days for grades 5-8). While at the center and on ensuing field trips to the estuary and ocean beach, each student participates in an active program of investigation, data collection, and/or problem interpretation and solution. The programs address basic skills development, organism identification, and environmental concerns. The metric system is used extensively. Vocabulary units are a part of each grade activity. Pre- and posttests measure cognitive gains by objective. All materials and instruments were developed and refined over a three-year period and subjected to extensive data analysis.

REQUIREMENT: This program requires access to an environmental studies center and an estuary or an ocean beach.

COSTS: Consult with contact named below.

SERVICES: Consult with contact named below.

CONTACT: Project Director; Environmental Studies Center; 2900 N.E. Indian River Drive; Jensen Beach, Florida 33457. (305) 334-1262

8. **PROJECT KARE** (Knowledgeable Action to Restore our Environment): An environmental studies approach using interdisciplinary learning activities based on environmental concerns in local communities.

AUDIENCE: Approved by JDRP for students of all abilities, grades K-12.

DESCRIPTION: **Project KARE** was designed to strengthen environmental studies in local schools. The KARE approach encourages students to confront real environmental problems through action-oriented interdisciplinary activities. Activities focus on a variety of environmental problems, including water pollution, community deterioration, and air contamination. Attitudes toward environmental issues are questioned, clarified, and frequently reformed. Staff responsibility includes field trips, community involvement, and curriculum development.

REQUIREMENTS: The Kare approach is implemented by classroom teachers working as an interdisciplinary team. In elementary schools, teachers from two to eight classes at various levels adopt a cooperative approach; in secondary schools, teachers from two or more disciplines are involved. The local school staff should consist of enthusiastic teachers and creative, resourceful administrators willing to work with students in planning and conducting environment studies activities.

COSTS: Consult with contact named below.

SERVICES: Consult with contact named below.

CONTACT: Matthew H. Hickey, Director; Project KARE; Montgomery County Intermediate Unit #23; Montgomery Avenue and Paper Mill Road; Erdenheim, Pennsylvania 19118. (215) 233-6900 and 6965.

SCIENCE PROGRAMS AND PRACTICES ORIGINATING OUTSIDE OF NEW JERSEY

The programs described in this section are a sample of the best of the national programs as identified by four professional associations: The American Association of School Administrators, The National Association of Secondary School Principals, The National Council of Teachers of Mathematics, and the National Science Teachers' Association. Unlike those reviewed by the National Diffusion Network, the programs described here have not undergone formal testing and approval for inclusion on the recommended list.

The programs are listed as "Science Programs"

OR

as "Science and Mathematics Programs"

NOTE: These programs were selected according to grade levels from an assortment of resource lists from The National Science Resource Center, National Science Foundation, and National Science Teacher Association.

SCIENCE PROGRAMS AND PRACTICES ORIGINATING OUTSIDE OF NEW JERSEY

Science Programs

		PAGE
1.	Behavior of Light	16
2.	Career-oriented Modules to Explore Topics in Science (COMETS)	16
3.	Carroll County Elementary Training/Coaching Program	16
4.	Create-A-Plant	17
5.	Creative Science Teaching on a Low Budget by the National Exemplary in Inquiry	17
6.	Dahlem Center School Program	18
7.	Ecosystems of the Chesapeake Bay	18
8.	Grandteacher Program	19
9.	Have a Healthy Heart	19
10.	Imprint of the Amerindian in the Connecticut River Valley--Archaeology: An Anthropological Seminar	19
11.	Iowa 4-9 Science Project	20
12.	Loma Vista Farm and Garden Center	20
13.	Mobile Energy Laboratory (MEL)	21
14.	Mobile Science Laboratory - Summer Science Program	21
15.	Nature's Classroom - A Living and Learning Experience	21
16.	Oceanic Education Activities for Great Lakes Schools	22
17.	Peer Science Teaching	22
18.	Project Oceanology	23
19.	Science Lab	23
20.	See What Science Is All About	23
21.	Shelburne Farm's Classroom Enrichment Institute (CEI)	24
22.	Simple Machines (LEGO) Unit	24

PAGE

23. Sound/Sound Waves/Musical Machines..... 25

24. Special In-service Training Efforts..... 25

25. Summer Science Program..... 26

26. West End Environmental Center..... 26

1. **BEHAVIOR OF LIGHT**

GRADE LEVEL: 6-8

DESCRIPTION: The goal of this practice is to observe the behavior of a single light beam as it: a) passes through a lens; b) passes through media of varying densities; c) strikes a shiny surface; and d) strikes a full surface. A laser beam is used as the principle light ray. This instrument, which replaces the film projector or flashlight, is used to direct a beam of light through or onto different materials. The materials needed include a set of standard convex and concave lenses, flat and curved mirrors, and any dull surface. This practice has been employed in grades six and eight for four years.

CONTACT: Sandra Jordon, Eighth Grade Teacher; Glen Meadow School; P.O. Box 516, Vernon; New Jersey 07462.

2. **CAREER-ORIENTED MODULES TO EXPLORE TOPICS IN SCIENCE (COMETS)**

GRADE LEVEL: Grades 5-9

DESCRIPTION: COMETS provides over 400 pages of materials with more than 100 activities that are organized into 24 modules. Most modules have Challenge Cards outlining open-ended student investigations, experimentation, and hands-on experiences, as well as computer activities and a number of opportunities for students to practice math skills. The materials, which emphasize women's contributions to science, also include a companion set of 24 biographical profiles, with each featuring a woman pursuing a science career, plus language arts activities, such as content quizzes, vocabulary building exercises, and directions for writing and projects. Because COMETS activities focus on several dozen different topics, they can easily be infused into or used to enhance general science, life science, physical science, earth science, or math classes.

CONTACT: Walter Smith, Professor; University of Kansas; 205 Bailey Hall; Lawrence, Kansas 66045.

3. **CARROLL COUNTY ELEMENTARY TRAINING/COACHING PROGRAM**

GRADE LEVEL: Elementary Teachers

DESCRIPTION: This program was offered to 280 elementary teachers to facilitate implementation of a new science program. Teachers were paid to participate in a series of two-day, grade-level training workshops during the summer. The instruction was designed not only to present the content of the new program, but also to have teachers physically work through the lessons they would later be doing with students. Two follow-up workshops during the school year served as problem-solving sessions that enabled them to work through difficulties that had arisen

as they implemented the program for the first time. Graduate assistants from a nearby university were assigned to work with teachers as coaches who helped with planning, gathering materials, and providing feedback. Outstanding teachers are selected for participation in a two-week, graduate-level Honors Workshop that trains them for a leadership role as a building-level resource person. These individuals are then brought in during the course of the year for follow-up workshops stressing content and methodologies.

CONTACT: Gary E. Dunkleberger, Science Supervisor; Carroll County Public Schools; 55 North Court Street; Westminister, Maryland 21157.

4. **CREATE-A-PLANT**

GRADE LEVEL: Grade 6

DESCRIPTION: The goal of this program is to introduce students to the steps of the scientific method, experimental design, and brainstorming, as well as to develop their understanding of plants' needs for survival. The class plays a game to create questions and then designs experiments that would answer those questions. Brainstorming techniques are introduced to the class and practiced individually, in small groups, and as a class. Students brainstorm a list of what plants need to survive, change items to variables, choose a variable, design and set up an experiment to measure the variable's effect on plant growth for ten days, and share results with the class. Students use an adapted form of "Invent a Plant" to combine all techniques and information learned. Students are given two conditions and an assortment of items with the task of brainstorming five plant designs, using the materials that would survive the conditions given. Each group presents their plant to the class, explains the functions of the parts, and defends its ability to survive the condition.

CONTACT: Ann H. Dudley, Science Coordinator; Torey J. Sabatini School; 359 Woodland Road; Madison, New Jersey 07940.

5. **CREATIVE SCIENCE TEACHING ON A LOW BUDGET BY THE NATIONAL EXEMPLAR IN INQUIRY**

GRADE LEVEL: Grades K-9

DESCRIPTION: The goals of this program are: to promote positive student attitudes toward science; to develop skills in the process of science, such as recognizing and identifying problems, stating hypotheses, understanding assumptions, observing carefully, and collecting and drawing proper conclusions; and to develop students' skills in using the instruments and proper techniques in science. The program provides opportunities for students to engage in a process of inquiry, collecting information and formulating principles relevant to the development of conceptual schemes of science; to design experiments

and construct the necessary apparatus; and to find, read, and interpret science literature. Students are shown how applications of the basic principles of science have contributed to the intellectual development of mankind and served an important role in attacking society's problems. In addition, career opportunities, in science as well as environmental problems, are explored.

CONTACT: Eva Kirkpatrick; National Exemplar in Inquiry; 3511 Stonebrook Forest Drive; Imperial, Missouri 63010.

6. **DAHLEM CENTER SCHOOL PROGRAM**

GRADE LEVEL: Grades Pre-K-5

DESCRIPTION: The Dahlem Center is an environmental education center that offers a series of environmental education/science programs to students from pre-school to fifth grade. The programs are designed to meet grade-specific science objectives, with particular attention focused on ecological principles. The center's rationale is that ecological foundations of the natural world, while interesting, have little transferability to the learner's home environment if a connection is not planned. The center seeks to bridge the gap between natural and built environments through a three-pronged approach: introducing a built ecological environment; developing concepts of the natural world; and applying the concepts in the student's home environment. These are accomplished through field trips to the center, teacher packets of pre-trip and post-trip activity ideas, student-handout masters, and other pertinent resources.

CONTACT: Diane Valen, Program Coordinator; Chalem Environmental Education Center; 7117 South Jackson Road; Jackson, Michigan 49201.

7. **ECOSYSTEMS OF THE CHESAPEAKE BAY**

GRADE LEVEL: Grades 5-6

DESCRIPTION: In cooperation with the Chesapeake Bay Foundation, a group of students explore various locations of the Patapsco River as it flows into the Chesapeake Bay. A research vessel, The Osprey, is equipped with the equipment the students need to test and analyze the water quality of the estuary for salinity, dissolved oxygen, pH, temperature, and turbidity. Other activities include dredging, navigating, seining for plankton, and plotting a bottom profile. The students also investigate stresses created by waterside industries, types of shipping activity in the harbor, and non-marine living things, such as birds and plant life, during this field trip.

CONTACT: James J. Sarnecki, Supervisor; Baltimore City Public Schools/Chesapeake Bay Foundation; Elementary Education Division; 1519 Winford Road; Baltimore, Maryland 21239.

8. **GRANDTEACHER PROGRAM**

GRADE LEVEL: Grades 2-5

DESCRIPTION: In September, 1985, a retired high school science teacher was appointed to serve as part-time consultant and resource person for second- and fifth-grade teachers and students in what is called the **Grandteacher Program**. The goals to increase the exposure of the children to science activities and experiences and to reduce the anxiety of teachers who do not feel comfortable with science lessons by providing them with examples, help, and support and The "grandteacher" is not an evaluator, but a treasury of experience in science teaching made available to the students and teachers in a non-threatening atmosphere. He or she is conducting a series of in-service workshops for the teachers, visiting 29 classrooms in five elementary schools to offer monthly science lessons of the lively, hands-on variety, using simple, inexpensive materials.

CONTACT: Larry McGowan, Grandteacher; Marlborough Public Schools; Bolton Street; Marlborough, Massachusetts 01752.

9. **HAVE A HEALTHY HEART**

GRADE LEVEL: Grades 4-8

DESCRIPTION: **Have a Healthy Heart** is a heart health education program with two major components: a heart health curriculum and an aerobic fitness program. Students learn and practice heart health habits they can use for life to help reduce the risk of heart disease. Teachers receive a complete heart health curriculum that is easy and convenient to use. The program can be implemented in regular classrooms or during science or health periods. Students progress through the **Have a Healthy Heart** fitness and lifestyle materials, as well as through activities in an aerobic fitness program. Lasting two to three months, the program usually takes one to two hours per week.

CONTACT: Sherry Avena, Developer; Model Classrooms, Inc.; 4095 173rd Place, S.E.; Belleville, Washington 98008.

10. **IMPRINT OF THE AMERINDIAN IN THE CONNECTICUT RIVER VALLEY--ARCHAEOLOGY: AN ANTHROPOLOGICAL SEMINAR**

GRADE LEVEL: Grades 6-12

DESCRIPTION: The goals of this program are for students: to recognize geological material; to participate in an anthropological study of prehistoric inhabitants of the Connecticut River Valley; to learn about the lives of the colonial people in the Connecticut River Valley; to experience the discipline of an archaeologist; to experience another viable, successful pattern of living by planning, designing,

and constructing an encampment; and to benefit from working cooperatively to achieve these goals. Teachers, local historians, and amateur archaeologists provide the students with background information, which students then apply in structured activities at a local museum and at an archaeological dig site.

CONTACT: Cynthia Field, Science Teacher; Timothy Edwards Middle School; 100 Arnold Way; South Windsor, Connecticut 06074.

11. **IOWA 4-9 SCIENCE PROJECT**

GRADE LEVEL: Science Teachers

DESCRIPTION: This project is designed to improve the background and skills of teachers in grades 4-9 through effective use of a proved science curriculum, technology, sound educational theory, and practical application-oriented activities. The project inservice enables teachers to explore a variety of activities, teaching strategies, teacher guides, and communication networks being developed by a peer group of exemplary teachers. The materials, which are intended to supplement popular texts, balance process skills, basic knowledge, and the application of science. The major outcomes of the workshops are: the increased capability of science teachers to deliver appropriate grade-level experiences that emphasize scientific reasoning; and the establishment of an interactive telecommunications network as an alternative delivery system for refining curriculum materials, managing scientific data, and providing a large data bank of materials and resources for science teachers.

CONTACT: George Magrane, Science Consultant; Southern Prairie AEA 15; Route 5, Box 55; Ottumwa, Iowa 52501.

12. **LOMA VISTA FARM AND GARDEN CENTER**

GRADE LEVEL: Grades 1-6 -- Special Education Students

DESCRIPTION: This thriving school-community project offers many teaching and learning opportunities for students and adults who use the facilities of the farm to "learn-by-doing." Through their experiences at the farm, students better understand concepts related to reading, math, communication, problem-solving, and especially human relations skills. Motivation is high when they must learn to read to interpret directions on feed and seed packets, or when they must learn math to weigh and measure livestock, or when they must learn to spell and write to compile notebooks or diaries of their observations. The practical demands of their farm project enable students to see the practical need to learn the subjects taught in school.

CONTACT: Thomas Arcadi, Project Director; Vallejo City Unified School District; 101 Cobb Avenue; Vallejo, California 94589.

13. **MOBILE ENERGY LABORATORY (MEL)**

GRADE LEVEL: Grades 3-8

DESCRIPTION: MEL, the district's traveling laboratory, is the focal point of West Shore's energy education program. Students in grades 3-8 participate in planned energy education programs during each school year, using locally-developed materials and learning stations on-board MEL to learn about energy conservation. MEL, a school bus remodeled to serve as a mobile classroom/laboratory, travels to the 15 school buildings in the district and connects to electrical and water supplies at each building. Instead of transporting students, this district brings the classroom to the students.

CONTACT: William R. Einsig, Science Advisor; West Shore School District; 1000 Hummel Avenue; Lemoyne, Pennsylvania 17043.

14. **MOBILE SCIENCE LABORATORY - SUMMER SCIENCE PROGRAM**

GRADE LEVEL: Grades K-11

DESCRIPTION: The **Mobile Science Laboratory** affords students the opportunity to expand their science and math skills as they focus on ecology, environmental studies, biology, earth science, camping skills, and good citizenship. The program, which is divided into elementary and secondary curriculums, is offered to students in grades K-11 in two mobile units made from two semi-trailers. The elementary students use the facilities during the school year, and the older students use them in the summer. These mobile labs, which are complete science classrooms equipped with sinks, gas, water, lights, counters, a library, and countless pieces of science apparatus are pulled to each elementary school and to the summer sites according to an arranged schedule. Two elementary science teachers travel with the labs during the school year.

CONTACT: Terrance Moriarty, Principal; Southwest Junior High School; Albert Lea District No. 241; South Highway 69; Albert Lea, Minnesota 56007.

15. **NATURE'S CLASSROOM - A LIVING AND LEARNING EXPERIENCE**

GRADE LEVEL: Grades 4-8

DESCRIPTION: **Nature's Classroom** is a nonprofit, multidisciplinary and residential program that incoporates both social science and environmental education. The chief aim of **Nature's Classroom** is to promote community awareness and cognition by enabling children to leave their normal home/school community and immerse themselves in a total living/learning experience for five days. The academic day is divided into two sections. Each morning, students are introduced to the

concept of dynamic equilibrium in the natural world, in social interactions, and within themselves. Through a process of carefully guided observations delicately controlled by instructors, students discover abilities to hypothesize, scientifically test, and draw subsequent conclusions. In afternoon classes, instructors emphasize motivational learning, relying on the out-of-doors to present activities which require cognition. Students are given a choice of various academic classes in which to undertake individual and group projects.

CONTACT: John Santos, Executive Director; Nature's Classroom, Inc.; RFD No. 1, Box 410; Southbridge, Massachusetts 01550.

16. **OCEANIC EDUCATION ACTIVITIES FOR GREAT LAKES SCHOOLS**

GRADE LEVEL: Grades 5-9

DESCRIPTION: **Oceanic Education Activities for Great Lakes Schools (OEAGLS)** is an interdisciplinary science program for intermediate students in grades 5-9. The project is designed to create a better understanding of the ocean and Great Lakes environments and of how these impact on the lives of people. Concepts from the existing curriculum are developed in an oceanic or Great Lakes context, and environmental themes are infused throughout. Areas of student study include: the effects of the Great Lakes on temperature and climate; coastal processes and erosion; pollution; shipping; and geography. The 23 curricular modules are easily integrated into existing curricula, but they may also be combined to form units of study.

CONTACT: Victor Mayer, Principal Investigator; College of Education; Ohio State University; 059 Ramseyer Hall, 29 West Woodruff; Columbus, Ohio 43210.

17. **PEER SCIENCE TEACHING**

GRADE LEVEL: K-5

DESCRIPTION: A group of fifth-grade students who are interested in science work one hour weekly with two high school mentors on projects which they then share with the rest of the school population. Two or three of the fifth graders go to individual classrooms and take over the role of the teacher during a regular science class period, presenting reports, explaining their projects, and involving the classes by handing out related printed materials in the form of word finds, crossword puzzles, vocabulary, and matching games. For example, a project on Halley's Comet includes explanatory posters, an illuminated model, and booklets containing pertinent information.

CONTACT: Rose G. Grabelsky, Science Consultant/Teacher; Lakeville School; 47-27 Javson Avenue; Great Neck, New York.

18. **PROJECT OCEANOLOGY**

GRADE LEVEL: Grades K-College

DESCRIPTION: **Project Oceanology,** a marine education center operated by a nonprofit association of public and private schools, provides a variety of resources to enable students, teachers, and others to learn about the ocean environment through direct on-the-water experiences. These include a research vessel, oceanographic equipment, a waterfront laboratory, and a trained staff of marine educators and technicians. The programs offered are: a) School Hours Sessions, wherein junior and senior high students travel to the project for on-the-water programs on such topics as oceanography, marine ecology, fisheries, maritime history, environmental impact, and coastal management; b) After-School Programs in which 30 students each semester work as a team on a research project involving oceanography, marine biology, aquarium studies, and coastal ecology; and c) Summer Programs, wherein small teams of students, carry out interdisciplinary studies of the marine environment.

CONTACT: Howard Weiss, Director; Interdistrict Committee for Project Oceanology; Averv Point; Groton, Connecticut 06340.

19. **SCIENCE LAB**

GRADE LEVEL: Grades K-6

DESCRIPTION: The Warner Science Lab provides hands-on experiences for elementary students in various concept areas of science. Each of 220 experiments identified and compiled in 11 different categories by the 1982-83 Warner teaching staff is designated as appropriate for a specific grade level. A student under the guidance of the classroom teacher selects an experiment and is scheduled for a 45-minute lab period. The lab offers six 45-minute lab periods daily, Monday through Wednesday, with a maximum of six students scheduled for any one 45-minute block of time. On these days, parent volunteers monitor the lab, helping students locate their experiments and the materials needed. On Thursdays and Fridays, teachers may schedule their entire class for a block of time. Upper elementary students use a recording sheet to report observations related to their experiments. Science awards are given upon completion of an experiment.

CONTACT: William Devich, Principal; Warner Elementary School; 2791 Koper Drive; Sterling Heights, Michigan 48077.

20. **SEE WHAT SCIENCE IS ALL ABOUT**

GRADE LEVEL: Elementary Teachers

DESCRIPTION: **See What Science Is All About** is a comprehensive videotaped program designed as in-service/pre-service training for

teachers at the K-6 level. The program is presented at two levels (K-3 and 4-6) and consists of eight videotapes which cover all major topics in earth, physical, and life science. Theory is explained in simple terms and supported with a variety of useful classroom activities. This program is currently being utilized by public and private schools, colleges, and universities in 38 states, Canada, and Puerto Rico. The goal of the program is to increase the quantity and quality of science instruction at the elementary level by explaining concepts in simple terms, demonstrating useful activities, and motivating teachers.

CONTACT: Erin Rockwell, Product Manager; INSIGHTS Visual Production; P.O. Box 644; Encinitas, California 92024.

21. **SHELBURNE FARMS CLASSROOM ENRICHMENT INSTITUTE (CEI)**

GRADE LEVEL: Elementary Teachers

DESCRIPTION: The Shelburne Farms Classroom Enrichment Institute is an in-depth training program for grades K-6 teachers. The purpose of the three-day training is to provide classroom teachers with a curriculum and instructional techniques needed to increase the quantity and quality of science and mathematics taught in elementary grades. Teachers are introduced to a curriculum that stresses an interdisciplinary, hands-on approach to student learning. In addition, the curriculum organizes elementary grade lessons according to the four seasons and the accompanying changes in the environment. During the institute, participants have the opportunity to practice many of the lessons under the guidance of project staff. CEI thus helps to build teacher competence and confidence in science and mathematics instruction. Participants receive a copy of the CEI Four Seasons Guidebook, which contains over 100 separate activities for classroom use, at the end of the institute.

CONTACT: Megan Camp, Director; Shelburne Farms Resources, Inc.; Shelburne, Vermont 05482.

22. **SIMPLE MACHINES (LEGO) UNIT**

GRADE LEVEL: Grade 6

DESCRIPTION: The goals established for this program are to develop students' understanding of the kinds, uses, mechanical advantage, and practical application of simple machines. Model construction and the role of friction are included. The concepts are achieved through hands-on construction of simple machine models, which are used to experience (experimentation) real tool and machine use (application). The materials include a teacher's guide written according to Madelyn Hunter's teaching style (by Anoka-Hennepin) and a LEGO/ Technic I set. The 12 lessons cover approximately one quarter of the sixth-grade science curriculum.

CONTACT: Rod Vacek, Science Coordinator; Anoka-Hennepin I.S.D. No. 11; Elementary Curriculum Office; Educational Service Center; 11299 Hanson Boulevard, N.W.; Coon Rapids, Minnesota 55433.

23. **SOUND/SOUND WAVES/MUSICAL MACHINES**

GRADE LEVEL: Grades 1-4

DESCRIPTION: Music curricula are generally limited to the nomenclature and theory of music, but surprisingly missing is the study of sound. The contention underlying this curriculum is that in order to understand pitch, timbre, intensity, and duration of musical sounds, one must first examine the nature of sound waves, the production of sounds, how sound travels, and the reception of sound waves. The developer of this project wrote a supplemental unit to the curriculum to introduce and explain these concepts to the music students. Methods include lectures, filmstrips, tapes, recordings, charts, art posters, and simple classroom experiments using the guitar, piano, woodwind reed, and tuning forks. Concepts covered include the study of vibration and the vocal cords, the qualities of sound, and the range of audibility of the human ear, as compared with that of other animals. This leads to a brief study of the structure of the ear. In addition, students study Edison's phonograph and examine the development of musical machines up to and including the laser disc.

CONTACT: Frederick Podorf, Principal; Walnut Ridge Primary School; P.O. Box 180, Route 517; Verona, New Jersey 07462.

24. **SPECIAL IN-SERVICE TRAINING EFFORTS**

GRADE LEVEL: Elementary Teachers

DESCRIPTION: A science materials center at the Kluge Elementary School provides regular classroom teachers in 30 selected schools with the supplies and equipment necessary to teach any elementary science unit in any grade, K-6. The materials for a given science unit at a given grade level are loaned for a period of four weeks, permitting each kit to be used six times during the year. Day-to-day operations are carried out by two aides who prepare the kits for delivery, refurnish them upon return (replacing the broken, missing, or consumable materials), and keep an inventory of materials in the center.

The school also established a teacher center to provide in-service education to all regular classroom teachers in the 30 selected elementary schools. As many as 20 teachers at any given grade level are released from their classrooms to attend two-day process-oriented training with a team of curriculum supervisors and a science teacher in-service specialist. The teachers also work through specific activities using the materials included in the science kits, which they can order from the Kluge Science Materials Center.

CONTACT: Neal Eigenfeld, Curriculum Specialist; Milwaukee Public Schools; 5225 West Street; P.O. Drawer 10K; Milwaukee, Wisconsin 53201-8210.

25. **SUMMER SCIENCE PROGRAM**

GRADE LEVEL: Grade 6

DESCRIPTION: During the summer of 1985, sixth-grade students had an exciting and unusual opportunity to attend a carefully developed, week-long (30 hours) outdoor science program which was designed to stimulate interest in the sciences. Each day during the week was unique, providing students with a lot of hands-on learning activities; and each day, a different instructor took the class on field trips to specially selected sites, such as Minneopa State Park, Lake Washington Park, Seven-Mile Creek County Park, Land-of-Memories Park, and others. Some of the topics covered in the program were stream biology; rocks, soil, and life in a part environment; interdependence of living things at the lake; and improving life in a wildlife area.

CONTACT: C.R. Nelson, Elementary Education Director; Mankoto Public Schools, District No. 77; 1000 North Broad Street; Mankoto, Minnesota 56001.

26. **WEST END ENVIRONMENTAL CENTER**

GRADE LEVEL: Grades K-5

DESCRIPTION: The Environmental Center, in operation since September, 1984, is contained within a classroom converted to simulate a natural environmental and expanded to include three greenhouse windows, potting tables, and an assortment of aquaria and terraria. The center provides an exciting learning arena in which students actively engage in a variety of hands-on experiences aimed at developing awareness, understanding, and appreciation of the interdependence of man and all aspects of our natural environment. The ultimate goal is to develop concerned, informed citizens who will maximize the potential of our natural environment. Major topics of study include plant and animal life; interdependence of man and nature; air, water, and land pollution; endangered species; world hunger; and the exploration of the sea and space as future resources for food and habitation.

CONTACT: Nola A. Bacci, Principal; West End School; Clark Avenue; Lynbrook, New York 11563.

SCIENCE PROGRAMS AND PRACTICES ORIGINATING OUTSIDE OF NEW JERSEY

Science and Mathematics Programs

		PAGE
1.	FOOD SAFETY ADDS UP TO GOOD HEALTH--YOU CAN COUNT ON IT	28
2.	GALILEO, JR	28
3.	GARLAND EXCELLENCE IN TEACHING PROGRAM	28
4.	HOMEWORK HOTLINE	29
5.	INSTRUCTIONAL MICROCOMPUTER PROJECTS FOR ARKANSAS CLASSROOMS (IMPAC)	29
6.	MASTERY LEARNING INSTRUCTIONAL MODEL	30
7.	MATH AND SCIENCE FOCUS FOR MODEL ROCKET CONSTRUCTION	30
8.	MATHEMATICS AND SCIENCE SKILLS COLLABORATIVE PROJECT	30
9.	MATHEMATICS/SCIENCE ENRICHMENT PROGRAM	31
10.	SATURDAY MORNING PROGRAMS	31
11.	SPECIAL CURRICULUM MATERIALS AND NOVEL ASSIGNMENTS COMBINING SCIENCE AND MATH WITH OTHER INSTRUCTIONAL TOPICS	32
12.	YOUNG SCIENTISTS	32

1. **FOOD SAFETY ADDS UP TO GOOD HEALTH--YOU CAN COUNT ON IT**

GRADE LEVEL: Grades 1-6

DESCRIPTION: Since 1982, elementary school students across the nation have learned how to use numbers to protect themselves from food poisoning. It is particularly important for children this age to learn how to properly handle and prepare perishable foods since over a quarter million children contract food poisoning each year. The purpose of the National Food Safety Poster Contest is to teach children the basics of safe food-handling practices, information that will serve them throughout their lives. The contest packages its health messages with math skills and drills. Students in grades one and two, for example, learn how to read a thermometer as they develop an understanding of the important role of temperature in keeping food safe. The materials provided prepare students to enter the poster contest and compete for top prizes -- saving bonds and trips to Washington, D.C. This annual contest is open to every first through sixth grader attending school in the United States.

CONTACT: Judy Liggett, Coordinator; National Food Safety Poster Contest; USDA-FSIS Room 1165S; Washington, D.C. 20250.

2. **GALILEO, JR.**

GRADE LEVEL: Grades 4-6

DESCRIPTION: Using the "Voyage of the Mimi" program as the keystone, **Galileo, Jr.** is a science/math/technology program in which students extend their knowledge, develop understanding of the scientific inquiry process, and apply skills to higher levels of learning. Problem solving through simulation and "real life" problems is an essential part of this program, which also includes "Mimi" television programs, computer software, and text material. High motivation and interest has led to integration with language arts and social studies.

CONTACT: Doris Selub, Assistant Superintendent; Freeport Public Schools; P.O. Box 50; Freeport, New York 11520.

3. **GARLAND EXCELLENCE IN TEACHING PROGRAM**

GRADE LEVEL: Science and Mathematics Teachers

DESCRIPTION: This program is an inservice that uses selective recruiting, instruction, and developmental supervision to produce a cadre of highly effective mathematics and science teachers in kindergarten through high school across the district. Twenty teachers were selected through a nomination, application, and review process to receive 45 hours of state-of-the-art instruction in "effective teaching practices" that are based on current literature and grounded in math

and science content. Upon completion of the program, these teachers use the instructional materials developed for the course to train other district teachers. The program is based on the premise that when science and math courses are effectively presented, reflecting knowledge of the recent literature on teacher effectiveness, student achievement and attitude toward these subject areas will improve.

CONTACT: Barbara Mason, Assistant Director of Research; Garland Independent School District; 720 Stadium Drive; Garland, Texas 75040.

4. **HOME HOTLINE**

GRADE LEVEL: Grades K-12

DESCRIPTION: **Homework Hotline** started in the LaPorte School System in October, 1984. The program's main goal, which initially was to assist K-12 students with their mathematics homework, has expanded since then to include help in science. Students needing help in both subjects can call the hotline number (Monday through Thursday from 5:30-8:00 p.m.) to obtain help from a math or science teacher on problems they encounter in completing their homework. Two high school students operate the switchboard and assist the teachers, who have access to the teachers' editions and workbooks that students are using in their math and science classes. Posters are placed in all buildings and in math and science classes to remind students of this program, and flyers are issued to every student at the beginning of the school year.

CONTACT: Freddie Renfro, K-12 Mathematics Coordinator; LaPorte Independent School District; 301 East Fairmont Parkway; LaPorte, Texas 77571.

5. **INSTRUCTIONAL MICROCOMPUTER PROJECTS FOR ARKANSAS CLASSROOMS (IMPAC)**

GRADE LEVEL: Grades 4-8

DESCRIPTION: IMPAC, a joint effort of government, education, business, and industry, provides basic skills support at 26 sites in the state. A commission directs the program; and some activities are conducted through a nonprofit company, IMPAC Learning Systems, Inc. The program provides complete technological support -- hardware, courseware, inservice, and maintenance; and CMI/CAT basic skills programs with management capability for mathematics, reading and language arts, and science are being developed for use with the Apple IIe/Corvus hard disk network. Approximately 25 microcomputers are used in a laboratory setting, or four computers are provided for use with self-contained programs.

CONTACT: Cecil McDermott, IMPAC Director; Arkansas Department of Education; State Education Buildings; Little Rock, Arkansas 72201.

6. **MASTERY LEARNING INSTRUCTIONAL MODEL**

GRADE LEVEL: Grades K-6

DESCRIPTION: The Goochland Schools now have several years of experience in the Mastery Learning Model Essentials-Correctives-Enrichment (ECE) program developed by Dr. Wayne Prutt and Dr. Jeff Lee of Francis Marion College, Florence, South Carolina. To improve the instructional delivery mode and students' mastery, ML units, requiring two to three weeks for implementation, focus on specific areas of identified need in math and science. The experiences afforded by the enrichment track provide extensive opportunities to develop research skills and creative expression, as well as to use audiovisual materials and computers. The units are reviewed by consultants, and one-to-one consultation is provided. The consistent language and procedure of the units provides a uniform approach to instruction, resulting in positive spin-offs into other subjects and easy adaptation by teachers.

CONTACT: Jacquelyn S. Lindsey, Instruction Director; Goochland County Public Schools; P.O. Box 169; Goochland, Virginia 23063.

7. **MATH AND SCIENCE FOCUS FOR MODEL ROCKET CONSTRUCTION**

GRADE LEVEL: Grades 6-8 -- Gifted Students

DESCRIPTION: The goal of this practice is to incorporate the basic principles of math and science into the building and launching of model rockets. Although not a new endeavor, the construction and launching of model rockets should be made available to a wide range of gifted and interested students, along with guidance in carrying out the innovations in math and science. The materials used are model rocket kits, launch systems, tracking devices, additional rocket construction kits, and math tracking projects. The activities involve the construction of kits and tracking devices, with instruction as to their use, plus innovative projects for additional observation. The length of time needed is two hours after school on two consecutive days, plus additional meetings to carry out the innovations.

CONTACT: Ann N. Laundry, Life Science Teacher; Angleton Middle School; 1800 North Downing Road; Angleton, Texas 77515.

8. **MATHEMATICS AND SCIENCE SKILLS COLLABORATIVE PROJECT**

GRADE LEVEL: Elementary teachers

This project is a collaborative effort between Worcester State College and approximately 50 elementary schools in Worcester and nearby towns. Each year, about 70 elementary teachers of grades K-6 take part in a series of programs on a Thursday afternoon/evening and all day on the following Friday. The meetings are led by subject matter specialists

from the college and are designed to increase the subject matter knowledge of the participants in various fields. Biology, astronomy, energy, geology, and mathematics are among the topics considered. Activities include a lecture, a laboratory session, and discussion on how the topic may be used in the elementary schools. Teachers leave each session with a variety of materials appropriate for use in their classrooms, and a resource center contains additional materials, which enables teachers to design their own. The professors are available to visit classes in the participating elementary schools.

CONTACT: William Belanger, Natural Science Professor; Worcester State College; 486 Chandler Street; Worcester, Massachusetts 01602.

9. **MATHEMATICS/SCIENCE ENRICHMENT PROGRAM**

GRADE LEVEL: Grades 3-8 -- Advanced Students

DESCRIPTION: The goal of this summer school program is to develop both interest and achievement in mathematics and science among children who demonstrate high achievement in schools where achievement ususally is low. Once identified, the children are invited by the superintendent to attend the summer session. Daily bus transportation to the summer enrichment center, where the students are engaged in mathematics and science experiences from 8:30 to 11:30 a.m., is provided. Field trips, motivational materials and topics, micro- computers, and an innovative staff combine to make the experience exciting for all involved. The project began in 1985 as an extension of the "Junior Scientist" summer program which has been in existence since 1983.

CONTACT: Vincent F. O'Connor, Mathematics Curriculum Specialist; Milwaukee Public Schools; P.O. Drawer 10K, 5225 West Vliet Street; Milwaukee, Wisconsin 53201-8210.

10. **SATURDAY MORNING PROGRAMS**

GRADE LEVEL: Grades 2-4

DESCRIPTION: **The Saturday Morning Searchers Program** for third and fourth graders, who must be accompanied by a parent, provides three-hour enrichment Saturday programs indoors during the winter and all-day field trips in the fall and spring. Many hands-on activities are included, even during time spent on the bus. Program activities include: Calculator Capers, which are hands-on activities using the calculator which each child keeps; LOGO, which enables each family to work together on a computer; Nature Experiences, which are trips to various state parks for nature walks and activities along the way; and Fossil Pit, which entails collecting a great variety of fossils.

The **Saturday Morning Peepers Program** for second graders, who also must be accompanied by a parent, offers three-hour enrichment Saturday

programs during the winter months, followed by field trips in the spring. Field trips include a bird lesson with a follow-up trip to the National Zoo in Washington, D.C., and a dinosaur lesson with a trip to the Smithsonian for a hands-on program.

CONTACT: Virginia Ellett, Program Specialist; Mathematics and Science Center; 2401 Hartman Street; Richmond, Virginia 23223.

11. **SPECIAL CURRICULUM MATERIALS AND NOVEL ASSIGNMENTS COMBINING SCIENCE AND MATH WITH OTHER INSTRUCTIONAL TOPICS**

GRADE LEVEL: Grades 6-8

DESCRIPTION: Robert Fulton Middle School is about to implement a special math/science program within the regular middle school curriculum. In an effort to connect these subjects to student learning in reading and social studies, this program focuses on inventions, robots, and the future and taps the students' creative processes in making discovery and invention possible. A broad range of discoveries and inventions are highlighted; and innovation, dreaming, and inventing through cloning, human hibernation, and genetic engineering are encouraged.

CONTACT: Glen Randall Stevens, Program Implementor; Robert Fulton Middle School; 2760 North First Street; Milwaukee, Wisconsin 53212-2499.

12. **YOUNG SCIENTISTS**

GRADE LEVEL: Grades K-3

DESCRIPTION: The **Young Scientists** program, which integrates specific science and mathematics concepts, is an innovative after-school program in which senior-level early childhood education students work with children, ages 5-8 (grades K-3), in the content areas of science and mathematics. Both large and small group instruction are incorporated into the program, which presents most of the concepts in learning centers, with materials gathered from any available source, including a large portion that are homemade.

CONTACT: Patricia K. Lowry, Assistant Professor; The University of Alabama; College of Education; P.O. Drawer R; University, Alabama 35486.

NEW JERSEY PROGRAMS

PROGRAMS OFFERED BY COMMUNITY GROUPS AND ASSOCIATIONS*

The programs included in this section originate from non-school organizations and are available as a supplemental activity for inclusion in the regular school program.

1 Morris Museum

2 Van Saum Zoo

3 Marine Mammal Stranding Association

4 New Jersey Audubon Society

5 Rock Brook Nature Center

6 Poricy Park

7 Weis Ecology Center

8 Bergen County Wildlife Center

9 Morris Museum (a, b, c)

10 Brookdale Community College (a, b, c)

11 Marine Consortium

*NOTE: This list includes resources based in New Jersey. Many additional resources will be available in New York and Pennsylvania, which may be close to a specific district.

1. **Organization:** **Morris Museum**
   Project: Birds of Prey
   Target Population: Grades 4 & above
   Contact Person: Grace Krzywicki 201-538-0454

   Program Description.

   This half-hour program about raptors is centered around an exhibit of New Jersey hawks and owls. The topics covered include: the characteristics of raptors; the differences between hawks and owls, with an emphasis on New Jersey species; adaptations to diurnal/nocturnal lifestyles; and conversation issues (e.g., DDT/pesticides; the re-introduction of eagles, peregrine falcons, and the osprey program). Hands-on materials for students include the wings, talons, and skull of a screech owl, as well as hawk and eagle pellets. (A live kestrel bird may also be used).

2. **Organization:** **Van Saum Zoo**
   Project: Animal Kingdom
   Target population: Grades 3-6
   Contact Person: Eileen Geaity 201-262-3771

   Program Description:

   This program offers students, Pre-K through 12th grade, a look at the animal kingdom through the use of slides and hands-on experiences with live animals. The zoo, which has an education building, offers programs to any school able to make the trip. In addition, programs are currently offered to schools within the county through the zoo's travel services. Discussions of anatomy, physiology, and adaptation are adjusted to accommodate different comprehension levels.

3. **Organization:** **Marine Mammal Stranding**
   Project: Marine Mammals & Sea Turtle
   Target Audience: Grades 3-8
   Contact Person: Robert Schoelkof 609-266-0538

   Program Description:

   Slide and lecture presentations on marine mammal strandings include explanation and discussion of the scientific information that can be obtained from stranded animals; information about pollution as it pertains to marine mammals, sea turtles, and human-related deaths, either through water pollution or fishing gear entrapments. Also included are slides depicting human diseases that are being studied using marine mammal parts and studies of live animals undergoing rehabilitation.

4. **Organization:** **NJ Audubon Society**
Project: Bridges to the Natural World
Target Population: Grades 4-8
Contact Person: Dale Rosselet 201-891-2185

Program Description:

Bridges to the Natural World is an interdisciplinary program that teaches our role in nature through the concepts of energy transfer, habitat, natural community relationships, adaptation, diversity, and natural cycles. The New Jersey Audubon staff will show teachers how to use their own school grounds as an ongoing, readily available resource for teaching the process of science.

5. **Organization:** **Rock Brook Nature Center**
Project: Nature Center
Target Population: Grades 4-8
Contact person: Rene Leiter 201-567-1265

Program Description:

The **Rock Brook Nature Center** provides a one and one-half hour, hands-on nature study program at its 150-acre facility. The maximum group size is 15.

6 **Organization:** **Poricy Park**
Project: Nature Center
Target Population: Grades 4-8
Contact Person: Pat Contvenas 201-842-5966

Program Description:

The center provides environmental programs for groups and the public, as well as custom-designed programs for schools and educational groups. These field experiences are designed to fit into the science curriculum of the individual class that is visiting the center.

7. **Organization:** **Weis Ecology Center**
Project: Environmental Center
Target Population: Grades 4-8
Contact Person: Tanya Oznowich 201-835-2160

Program Description:

The center's objective is to provide the general public with activities and programs that increase awareness of the natural environment.

During the school year, the center offers both day and residential environmental education programs. Other programs are geared to the age and curriculum requirements of the students. Professional environmental educators lead all activities, which include lectures, walks, and hands-on activities on the property.

8. **Organization:** **Bergen County Wildlife Center**
Project: Ecology
Target Population: Grades 4-8
Contact Person: David Rimmer 201-891-5571

Program Description:

Unlike other nature programs offered by the Wildlife Center, the ecology program does not require special equipment or unique supplies. All an instructor needs is yarn, picture cards, and the outdoors. "Beginning Ecology" is a one-hour program which involves brief discussion, a food web game, and a walk in the woods or schoolyard. Creative thinking (composing good chains), physical activity (taking the outdoor walk), and class participation (engaging in discussion and web game) are stressed. The concepts are extremely important and easily illustrated.

9a. **Organization:** **Morris Museum**
Project: Museum-Volcanoes
Target Population: Grades 4-8
Contact Person: Grace Krzywicki 201-538-0454

Program Description:

The volcano program, which identifies the three major areas in which volcanoes occur on earth, is a slide program supported by numerous hands-on experiences, as well as samples of the different types of volcanic rocks. A cross-section illustration is also used to show the different parts of a volcano.

9b. **Organization:** **Morris Museum**
Project: Solar
Target Population: Grades 4-8
Contact Person: Grace Krzywicki 201-538-0454

Program Description:

This program covers: the solar system, the planets, our galaxy, the Milky Way, the universe, man's reach into space, satellites, the moon, and the space shuttle.

9c. **Organization:** **Morris Museum**
Project: Dinosaurs
Target Population: Grades 4-8
Contact Person: Grace Krzywicki 201-538-0454

Program Description:

"Dinosaurs", which is supported by a fossil gallery that includes exhibits of New Jersey Fossils and Dinosaur Tracks, presents information about where dinosaurs are found, as well as samples of dinosaur bones, gastoliths, and several displays. It also offers slide a presentation depicting actual skeletons of Tyrannosaurus, Triceratops, and numerous other important dinosaurs, such as the Hadrosaurus (which is important to New Jersey).

10a. **Organization:** **Brookdale College**
Project: Sandy Hook
Target Population 4 & above
Contact Person: Dave Grant 201-874-2284

Program Description:

This experimental, ten-week program provides educational opportunities for 6th- through 10th-grade students identified by their districts as exceptionally gifted and talented. Sandy Hook, a natural resource in Monmouth County, is unique in its physical and historical features and affords an exceptionally rich environment in which to explore and learn about energy, history, environment, engineering, marine science, aesthetics, and natural history. The guiding principle behind the program is discovery. The activities, which are varied, provide students with new and different experiences that encourage learning and promote lasting memories and thoughts to explore in the future.

Special credit goes to Dave Grant for curriculum development and the American Littoral Society, Natural Park Services, Natural Sea Grant Program, and others for use of their articles. **The Topic is Sandy Hook I** is one of many school programs for gifted and talented students now being expanded and coordinated by Community Services, Brookdale Community College, Lincroft, N.J. 07735.

10b. **Organization:** **Brookdale College**
Project: County Parks
Target Population: Grade 5 - High School
Contact Person: Dave Grant 201-874-2284

Program Description:

Not available.

10c. **Organization:** **Brookdale College**
Project: Day Trips
Target Population: Grade 6 - High School
Contact Person: Dave Grant 201-874-2284

Program Description:

Brookdale College maintains two fine facilities at Sandy Hook for the study of the ocean. Led by a naturalist, visiting groups explore the sea or study local marine life in the college's lab. Building facilities include classroom space, collecting equipment, and microscopes. A trained staff member will assist teachers and students during field trips.

11. **Organization:** **Marine Consortium**
Project: Marine Education Programs
Target Population: Grade 7 - High School
Contact Person: Barbara Syers 609-390-3320

Program Description:

The New Jersey Marine Sciences Consortium conducts marine awareness programs for K-12 New Jersey students and teachers. The programs, which focus on the importance and conservation of marine environments, encompass science and interdisciplinary field and classroom studies. The activities, which entail daily field trips to a marsh and an ocean beach, advanced field programs, marine sampling cruises (boat), school visitations, extended field studies, and teacher workshops, include: seining, trawling, plankton sampling, marsh and beach zonation, and water analysis.

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